

## WHAT IS CLAIMED IS:

1. An isolated protein comprising a member selected from the group consisting of:
  - (a) a polypeptide of at least 30 contiguous amino acids from the polypeptide of SEQ ID NO: 2;
  - (b) the polypeptide of SEQ ID NO: 2;
  - (c) a polypeptide having at least 80% sequence identity to, and having at least one linear epitope in common with, the polypeptide of SEQ ID NO: 2; wherein the percent sequence identity is determined according to the GAP program in the Wisconsin Genetics Software Package, using the default settings; and
  - (d) a polypeptide encoded by a polynucleotide which selectively hybridizes under stringent hybridization conditions and a wash in 0.1XSSC at 60°C to a polynucleotide selected from the group consisting of SEQ ID NOS: 1, 5, and 7.
2. A recombinant expression cassette expressing a member of claim 1.
3. A non-human host cell comprising the recombinant expression cassette of claim 2.
4. A transgenic plant comprising the recombinant expression cassette of claim 2.
5. The transgenic plant of claim 4, wherein the plant is a monocot or a dicot.
6. The transgenic plant of claim 5, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley and millet.

7. A method of producing a male sterile phenotype in a plant, comprising:
- (a) introducing into a plant cell a Rad2/FEN-1 polynucleotide to produce a transformed cell;
  - (b) culturing the plant cell under plant growing conditions; and
  - (c) inducing expression of the Rad2/FEN-1 polynucleotide for a time sufficient to produce a male sterile phenotype in the plant.
8. The method of claim 7, wherein the Rad2/FEN-1 polynucleotide is a polynucleotide selected from the group consisting of:
- (a) a polynucleotide having at least 70% sequence identity to a polynucleotide selected from the group consisting of SEQ ID NOS: 1, 5, and 7; wherein the percent sequence identity is based on the entire coding region and is calculated by the GAP algorithm under default parameters;
  - (b) a polynucleotide encoding a polypeptide selected from the group consisting of SEQ ID NOS: 2, 4 and 8;
  - (c) a polynucleotide amplified from a *Zea mays* nucleic acid library using primers which selectively hybridize, under stringent hybridization conditions and a wash in 0.1X SSC at 60°C, to a polynucleotide selected from the group consisting of SEQ ID NOS: 1, 5, and 7;
  - (d) a polynucleotide which selectively hybridizes, under stringent hybridization conditions and a wash in 0.1X SSC at 60°C, to a polynucleotide selected from the group consisting of SEQ ID NOS: 1, 5, and 7;
  - (e) a polynucleotide selected from the group consisting of SEQ ID NOS: 1, 3, 5, and 7;
  - (f) a polynucleotide which is complementary to a polynucleotide of (a), (b), (c), (d), or (e); and
  - (g) a polynucleotide comprising at least 25 contiguous nucleotides from a polynucleotide of (a), (b), (c), (d), (e), or (f); wherein the

polynucleotides of parts (a), (b), (c), (d), and (e) each encode Rad2/FEN-1 polypeptides.

9. The method of claim 7 wherein the Rad2/FEN-1 polynucleotide is in the sense orientation.
10. The method of claim 7 wherein the Rad2/FEN-1 polynucleotide is in the antisense orientation.
11. A transgenic plant produced by the method of claim 7.
12. The transgenic plant of claim 11, wherein the plant is a monocot or a dicot.
13. The transgenic plant of claim 12, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
14. A transgenic seed produced by the plant of claim 11.
15. A method of increasing targeted gene insertion comprising:
  - (a) introducing into a plant cell a polynucleotide of interest and a Rad2/FEN-1 polynucleotide encoding a Rad2/FEN-1 polypeptide to produce a transformed cell;
  - (b) culturing the transformed plant cell under cell growing conditions; and
  - (c) inducing expression of the Rad2/FEN-1 polypeptide for a time sufficient to increase the targeted gene insertion of the polynucleotide of interest.
16. The method of claim 15, wherein the polynucleotide encodes a Rad2/FEN-1 polypeptide selected from the group consisting of:

- (a) a polypeptide of at least 30 contiguous amino acids from the polypeptide of SEQ ID NO: 2;
- (b) the polypeptide of SEQ ID NO: 2;
- (c) a polypeptide having at least 80% sequence identity to, and having at least one linear epitope in common with, the polypeptide of SEQ ID NO: 2; wherein the percent sequence identity is determined according to the GAP program in the Wisconsin Genetics Software Package, using the default settings; and
- (d) a polypeptide encoded by a polynucleotide which selectively hybridizes under stringent hybridization conditions and a wash in 0.1XSSC at 60°C to a polynucleotide selected from the group consisting of SEQ ID NOS: 1, 5, and 7.

17. The method of claim 15 wherein the plant cell is from a monocot or a dicot.
18. The method of claim 17, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
19. A transformed plant cell produced by the method of claim 15.
20. The plant cell of claim 19, wherein the plant cell is from a monocot or a dicot.
21. The plant cell of claim 20, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
22. The method of claim 15, wherein the transformed plant cell is grown under conditions sufficient to produce a transformed plant.
23. A transformed plant produced by the method of claim 22.

24. The plant of claim 23, wherein the plant is a monocot or a dicot.
25. The plant of claim 24, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
26. A transgenic seed produced by the plant of claim 23.
27. The method of claim 15, wherein the Rad2/FEN-1 polynucleotide and the polynucleotide of interest are introduced into the plant cell simultaneously.
28. A transformed plant cell produced by the method of claim 27.
29. The plant cell of claim 28, wherein the plant cell is from a monocot or a dicot.
30. The plant cell of claim 29, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
31. The method of claim 27, wherein the transformed plant cell is grown under conditions sufficient to produce a transformed plant.
32. A transformed plant produced by the method of claim 31.
33. The plant of claim 32, wherein the plant is a monocot or a dicot.
34. The plant of claim 33, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.

35. A transgenic seed produced by the plant of claim 32.
36. The method of claim 15, wherein the Rad2/FEN-1 polynucleotide is introduced into the plant cell prior to the introduction of the polynucleotide of interest.
37. A transformed plant cell produced by the method of claim 36.
38. The plant cell of claim 37, wherein the plant cell is from a monocot or a dicot.
39. The plant cell of claim 38, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
40. The method of claim 36, wherein the transformed plant cell is grown under conditions sufficient to produce a transformed plant.
41. A transformed plant of produced by the method claim 40.
42. The plant of claim 41, wherein the plant is a monocot or a dicot.
43. The plant of claim 42, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley and millet.
44. A transgenic seed produced by the plant of claim 41.
45. A method of increasing transformation efficiency comprising:  
(a) introducing into a plant cell a polynucleotide of interest and a Rad2/FEN-1 polynucleotide encoding a Rad2/FEN-1 polypeptide to produce a transformed plant cell;

- (b) culturing the plant cell under cell growing conditions; and
- (c) inducing expression of the Rad2/FEN-1 polypeptide for a time sufficient to increase the transformation efficiency of the polynucleotide of interest.

46. The method of claim 45, wherein the polynucleotide encodes a Rad2/FEN-1 polypeptide selected from the group consisting of:

- (a) a polypeptide of at least 30 contiguous amino acids from the polypeptide of SEQ ID NO: 2;
- (b) the polypeptide of SEQ ID NO: 2;
- (c) a polypeptide having at least 80% sequence identity to, and having at least one linear epitope in common with, the polypeptide of SEQ ID NO: 2; wherein the percent sequence identity is determined according to the GAP program in the Wisconsin Genetics Software Package, using the default settings; and
- (d) a polypeptide encoded by a polynucleotide which selectively hybridizes under stringent hybridization conditions and a wash in 0.1XSSC at 60°C to a polynucleotide selected from the group consisting of SEQ ID NOS: 1, 5, and 7.

47. The method of claim 45 wherein the plant cell is from a monocot or a dicot.

48. The method of claim 47, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.

49. A transformed plant cell produced by the method of claim 45.

50. The plant cell of claim 49, wherein the plant cell is from a monocot or a dicot.

51. The plant cell of claim 50, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
52. The method of claim 45, wherein the transformed plant cell is grown under conditions sufficient to produce a transformed plant.
53. A transformed plant produced by the method of claim 52.
54. The plant of claim 53, wherein the plant is a monocot or a dicot.
55. The plant of claim 54, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
56. A transgenic seed produced by the plant of claim 53.
57. The method of claim 45, wherein the Rad2/FEN-1 polynucleotide and the polynucleotide of interest are introduced into the plant cell simultaneously.
58. A transformed plant cell produced by the method of claim 57.
59. The plant cell of claim 58, wherein the plant cell is from a monocot or a dicot.
60. The plant cell of claim 59, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
61. The method of claim 57, wherein the transformed plant cell is grown under conditions sufficient to produce a transformed plant.



62. A transformed plant produced by the method of claim 61.
63. The plant of claim 62, wherein the plant is a monocot or a dicot.
64. The plant of claim 63, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
65. A transgenic seed produced by the plant of claim 62.
66. The method of claim 45, wherein the Rad2/FEN-1 polynucleotide is introduced into the plant cell prior to the introduction of the polynucleotide of interest.
67. A transformed plant cell produced by the method of claim 66.
68. The plant cell of claim 67, wherein the plant cell is from a monocot or a dicot.
69. The plant cell of claim 68, wherein the plant cell is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
70. The method of claim 66, wherein the transformed plant cell is grown under conditions sufficient to produced a transformed plant.
71. A transformed plant produced by the method of claim 70.
72. The plant of claim 71, wherein the plant is a monocot or a dicot.

73. The plant of claim 72, wherein the plant is selected from the group consisting of: maize, soybean, sunflower, sorghum, canola, wheat, alfalfa, cotton, rice, barley, and millet.
74. A transgenic seed produced by the plant of claim 71.

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